



U.S. Department of Energy
Office of Civilian Radioactive Waste Management



Surface Facility Design and Operations

Presented to:
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Technical Exchange Meeting**

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Preclosure Safety Analysis Process

- Internal and external hazards analyses identify hazards
- Screening and assessment analyses estimate frequency of event sequences
- Consequence analyses estimate doses to public and workers from event sequences
- Classification analyses identify systems, structures, and components that are important to safety (ITS)
- Nuclear safety design basis document captures design requirements



Implementation of Preclosure Safety Analysis in Design

- Repository is designed to prevent event sequences where possible; mitigate those not preventable
- Structures, systems, and components that prevent or mitigate Category 1 or 2 event sequences are ITS
- Evaluations based on maximum facility capacity and throughput rates for Category 1 event sequence frequency analyses, and on nominal rates for normal operations
- Consequence evaluations of Category 2 event sequences based upon maximum facility capacity



Implementation of Preclosure Safety Analysis in Design

(Continued)

- **Component reliability assigned based upon industry historical data; becomes design requirement for equipment procurement**
- **If a potential event sequence is prevented by design, and therefore doesn't result in dose, it is not identified as a final event sequence**
- **Results show Category 1 event sequences driven by handling large numbers (approximately 221,000) of individual commercial spent nuclear fuel (CSNF) assemblies**
- **Category 2 event sequences driven by handling of casks, canisters, and waste packages**



Implementation of Preclosure Safety Analysis in Design

(Continued)

- **Category 1 Event Sequences**
 - Two event sequences (Fuel Handling Facility [FHF] and Dry Transfer Facility [DTF] only)
 - ♦ Drop of individual CSNF assembly
 - ♦ Collision of individual CSNF assembly
- **Category 2 Event Sequences**
 - Three event sequences bound about 30 total
 - ♦ Drop and breach of transportation cask with 74 boiling water reactor (BWR) or 36 PWR CSNF assemblies
 - ♦ Drop and breach of transportation cask with five high-level waste (HLW) canisters
 - ♦ Drop and breach of one naval canister



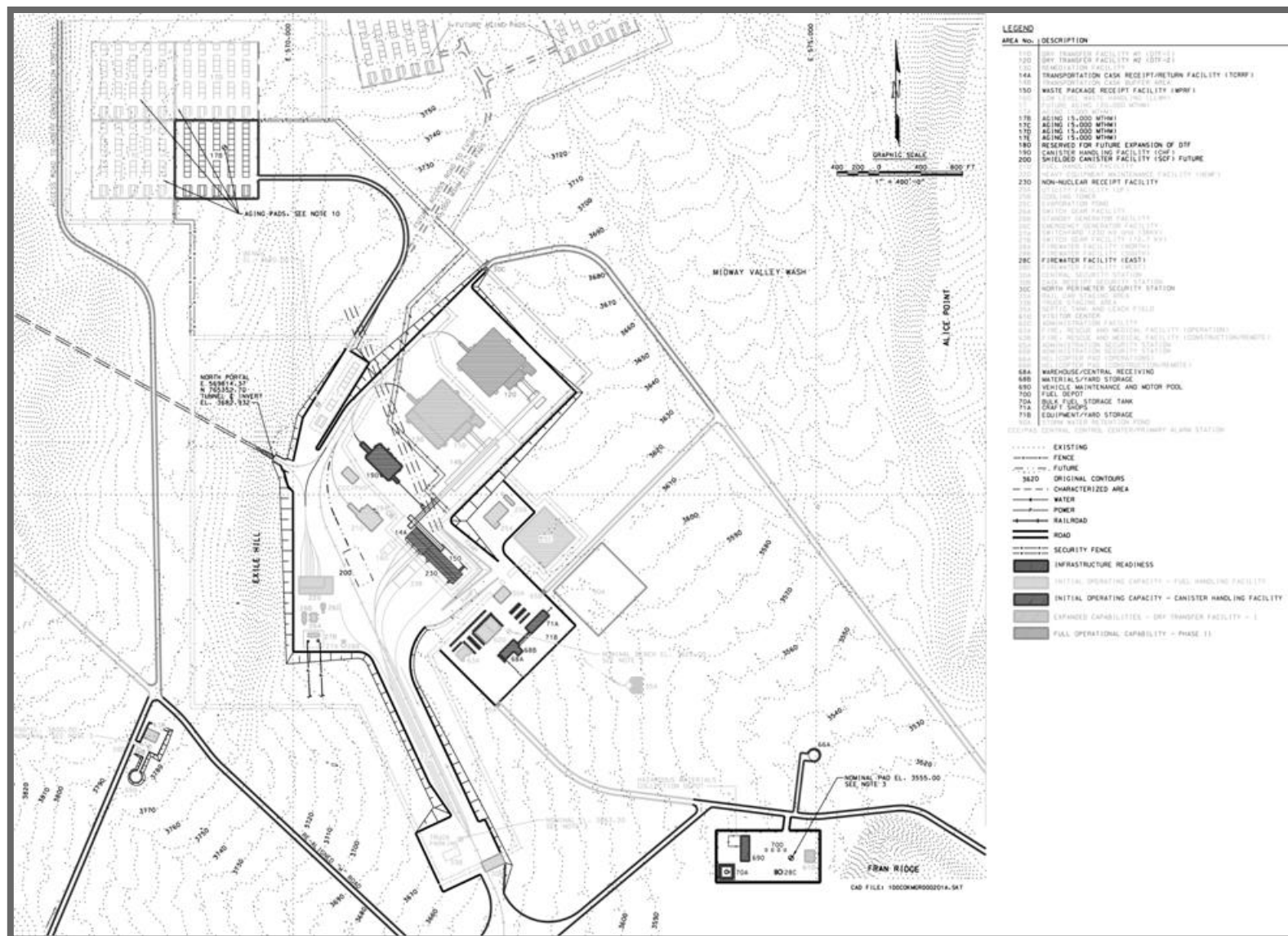
Implementation of Preclosure Safety Analysis in Design

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- **ITS components for prevention**
 - Facility structure provides protection from hazards and support for handling equipment
 - Handling devices, including cranes, fuel transfer machines, and carts, are credited with sufficient reliability to minimize number of drops
 - Moderator controls for preclosure criticality
- **ITS components for mitigation**
 - Portions of ventilation system, including HEPA filters, exhaust system and fans, and supply air ductwork, as well as related portions of the electrical system
 - Provides air exchanges and filtration to trap particulates resulting from drop or collision of spent nuclear fuel (SNF) assemblies

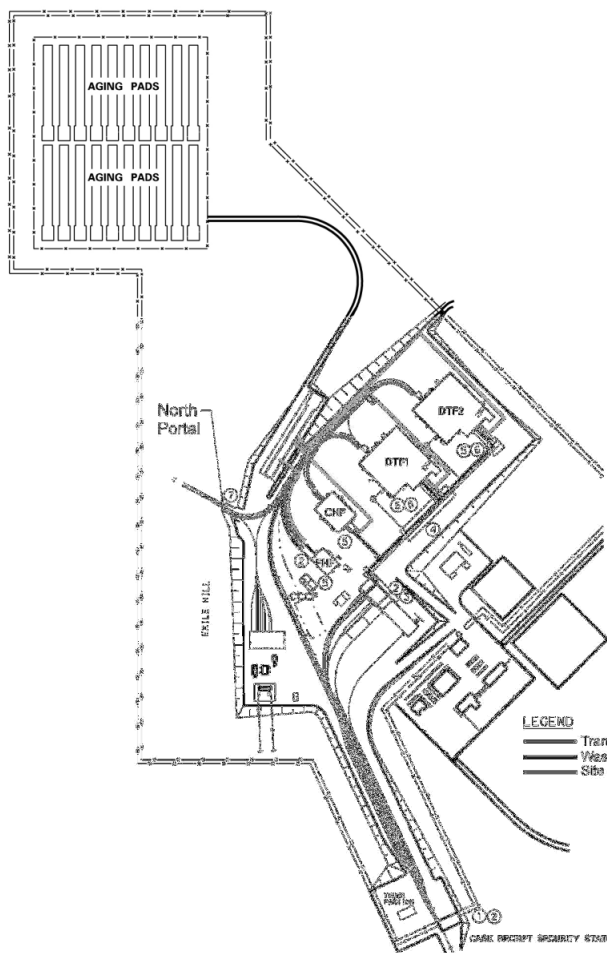


Surface Facility Description



Surface Facility Operations

Normal Operations Flows



SUMMARY OF ACTIVITIES

- ① Initial receipt waste acceptance criteria confirmation and security screening
- ② Radiological survey
- ③ Transfer of transportation cask to site rail transfer cask
- ④ Short-term staging of transportation casks in buffer area
- ⑤ Transfer of waste to waste package or site specific cask; closure of waste package or site specific cask; waste package surface inspection; shielded waste package transporter
- ⑥ Wet or dry remediation of damaged fuel or non-standard items
- ⑦ Transport of waste package to assigned emplacement drift

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Waste Handling Facilities

FHF: Up to 40 Waste Packages/yr

- CSNF
- HLW and DOE SNF

CHF: Up to 180 Waste Packages/yr

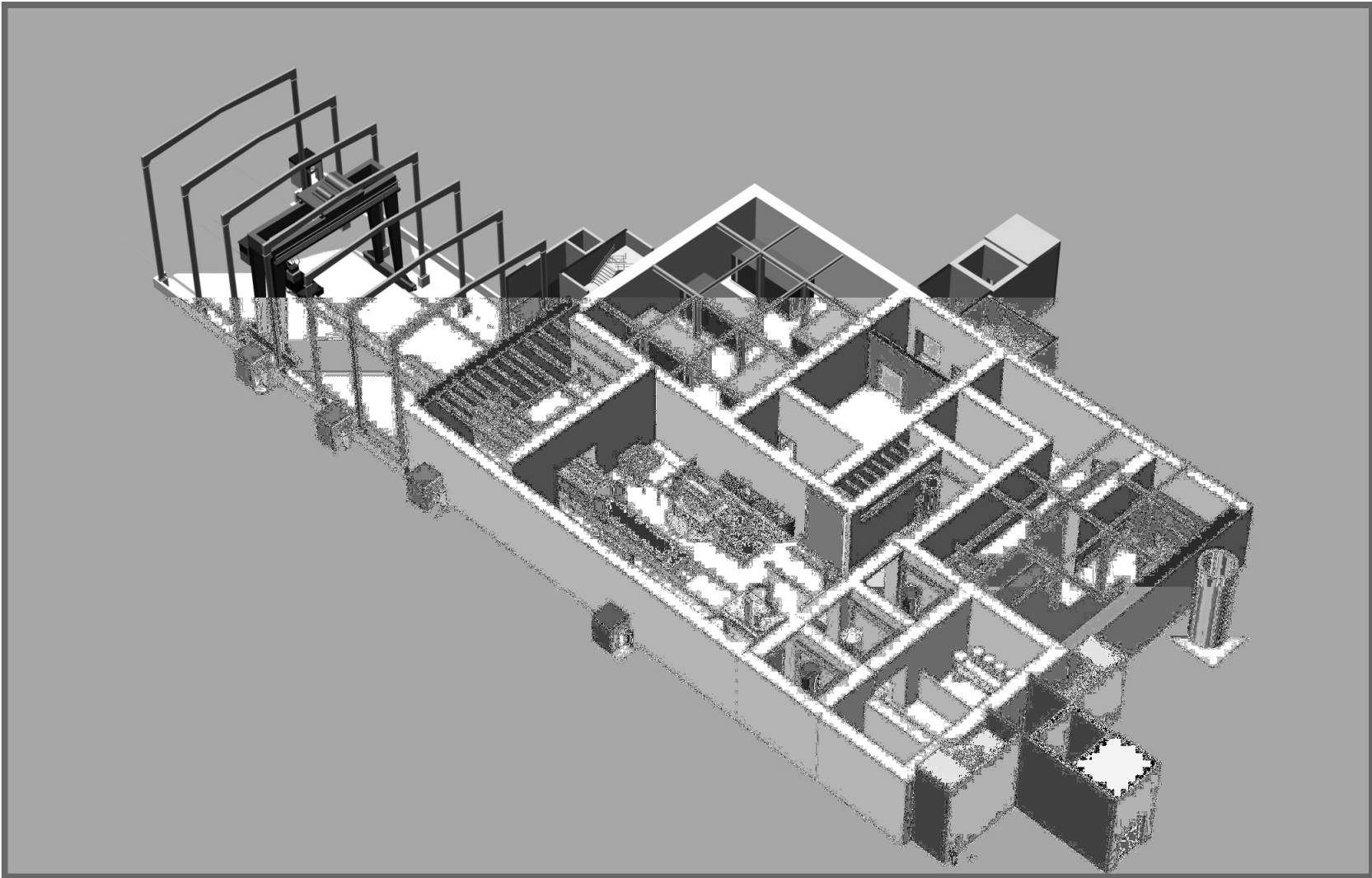
- HLW and DOE SNF

DTF: Up to 180 Waste Packages/yr

- CSNF
- HLW and DOE SNF
- Full remediation capability



Fuel Handling Facility Description



Fuel Handling Facility Operations

MATERIAL FLOW PATH

CASK OPERATIONS

- 1 REMOVE IMPACT LIMITERS AND PERSONNEL BARRIER
- 2 UP-END CASKS
- 3 PREPARE CASK
- 4 MOVE TO CASK TRANSFER AREA
- 5 RESTORE CASK

WP OPERATIONS

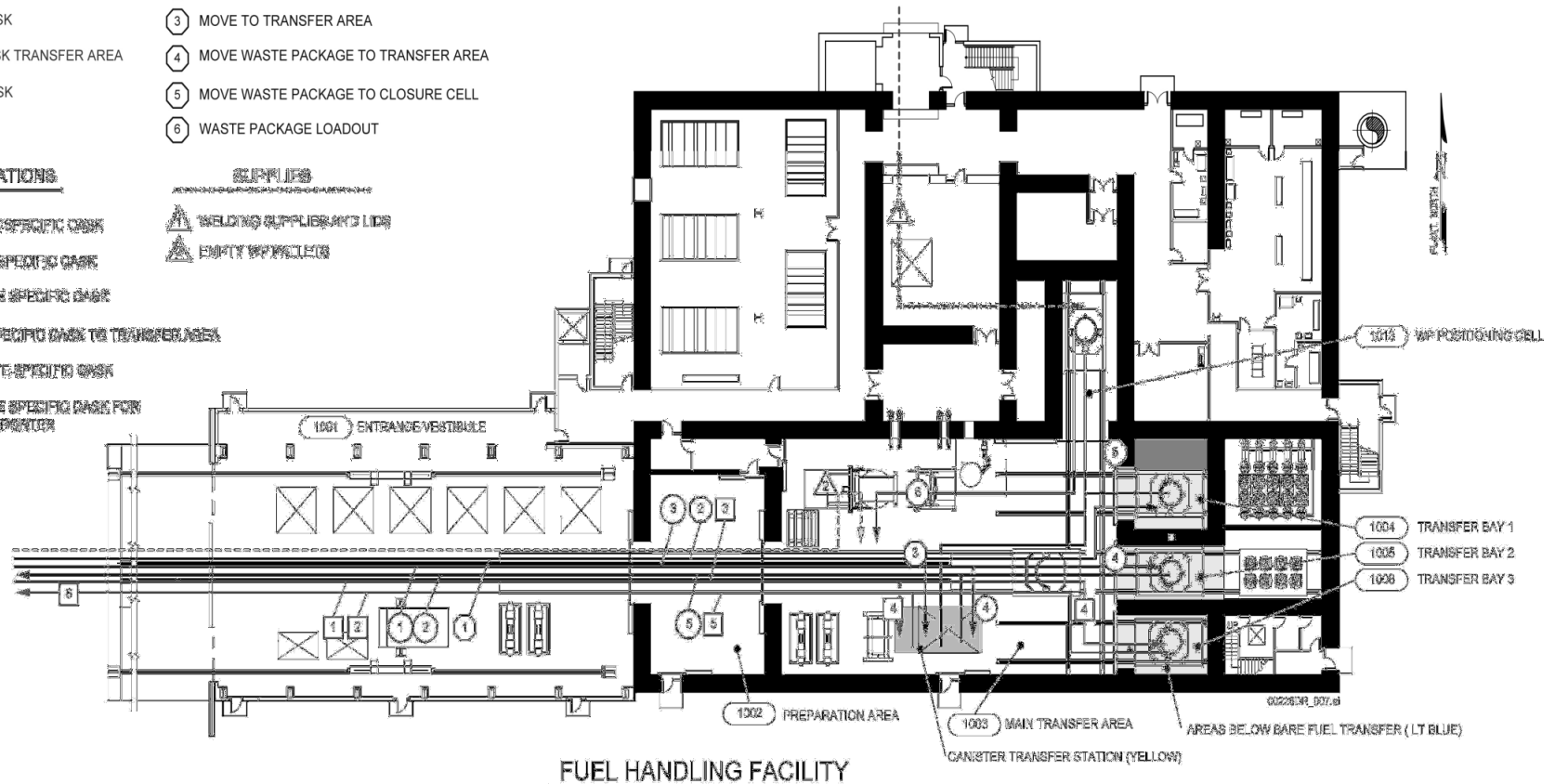
- 1 RECEIVE EMPTY WASTE PACKAGE
- 2 PREPARE WASTE PACKAGE
- 3 MOVE TO TRANSFER AREA
- 4 MOVE WASTE PACKAGE TO TRANSFER AREA
- 5 MOVE WASTE PACKAGE TO CLOSURE CELL
- 6 WASTE PACKAGE LOADOUT

MSG OPERATIONS

- 1 RECEIVE SITE-SPECIFIC CASK
- 2 UP-END SITE-SPECIFIC CASK
- 3 PREPARE SITE-SPECIFIC CASK
- 4 MOVE SITE-SPECIFIC CASK TO TRANSFER AREA
- 5 RESTORE SITE-SPECIFIC CASK
- 6 POSITION SITE-SPECIFIC CASK FOR AIRBORNE TRANSPORT

SUPPLIES

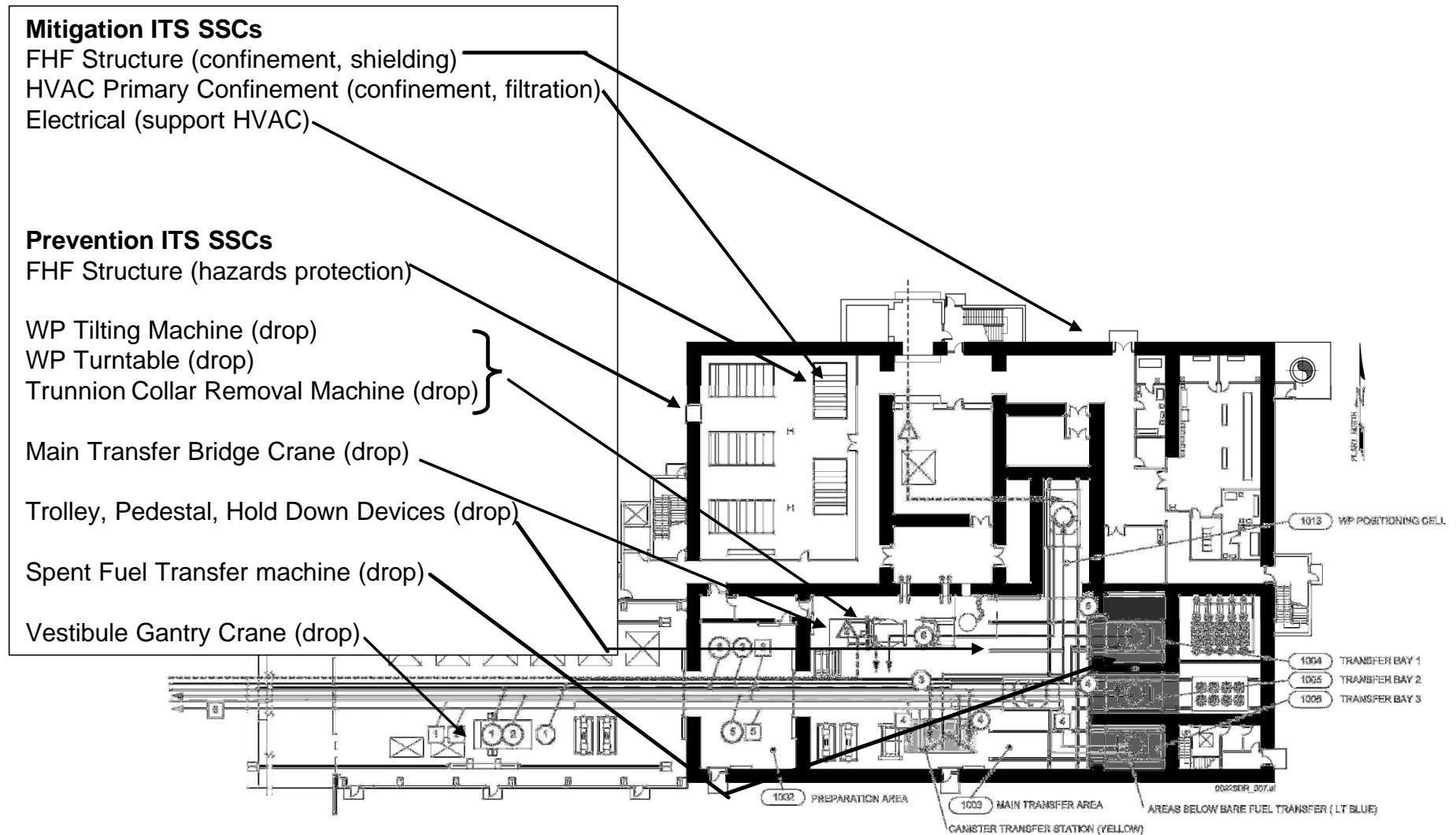
- WELDING SUPPLIES AND LIDS
- EMPTY WP VEHICLES



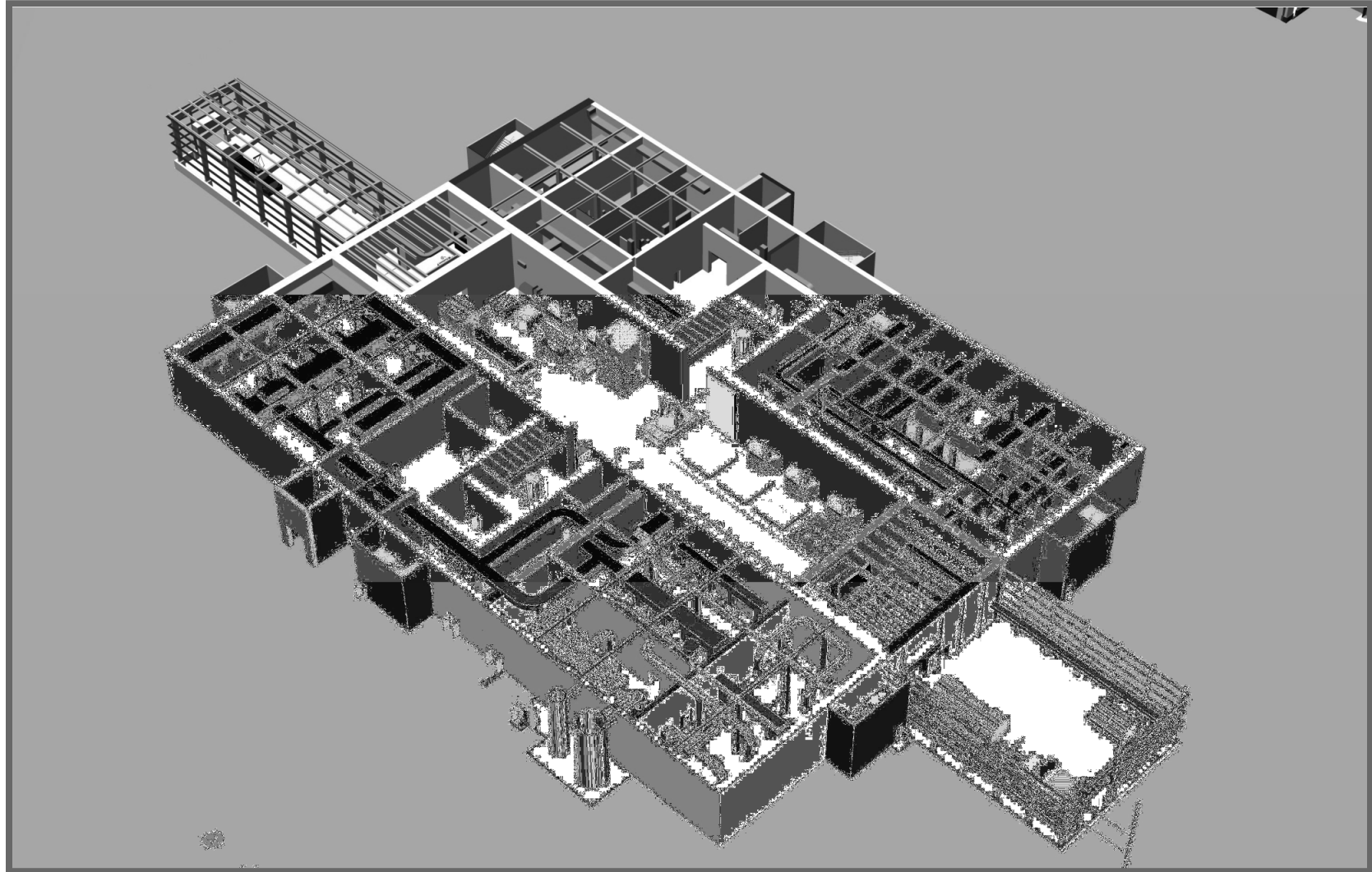
FUEL HANDLING FACILITY



Fuel Handling Facility: Important to Safety Structures, Systems, or Components



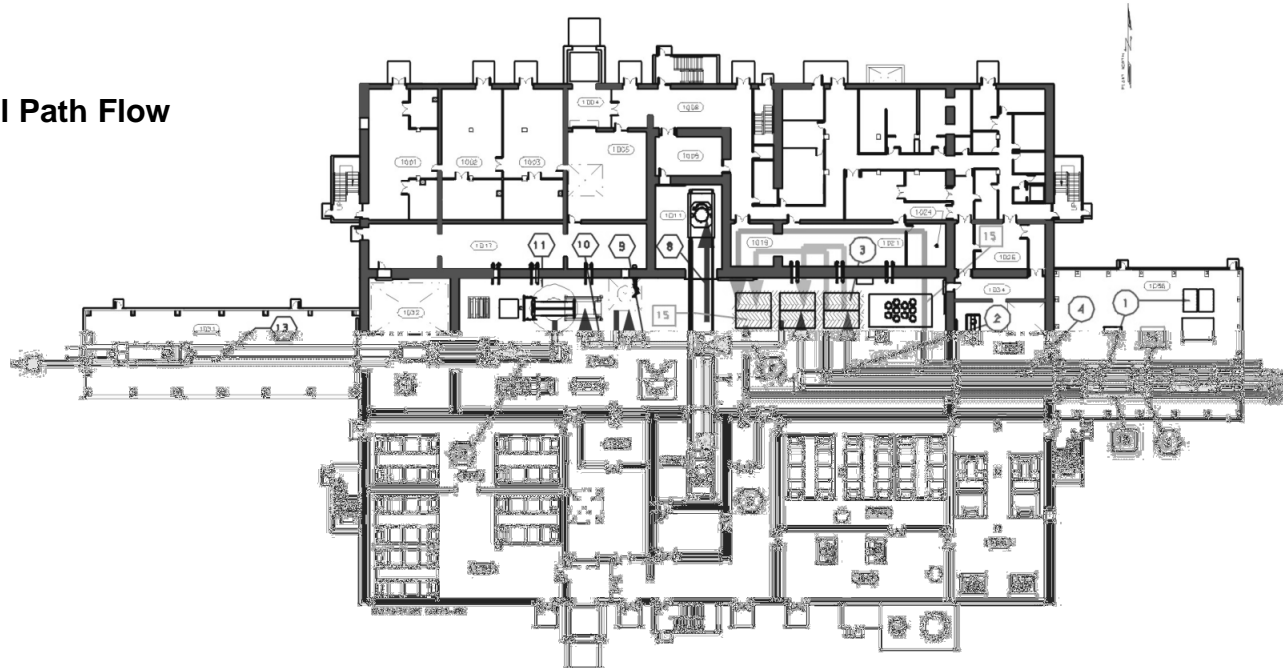
Canister Handling Facility Description



Canister Handling Facility Operations

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Material Path Flow



TRANSPORTATION CASK OPERATIONS

- ① Remove Impact Limiters and Personnel Barrier
- ② Open Cask
- ③ Transfer Cask to Pit
- ④ Return Cask

WASTE PACKAGE OPERATIONS

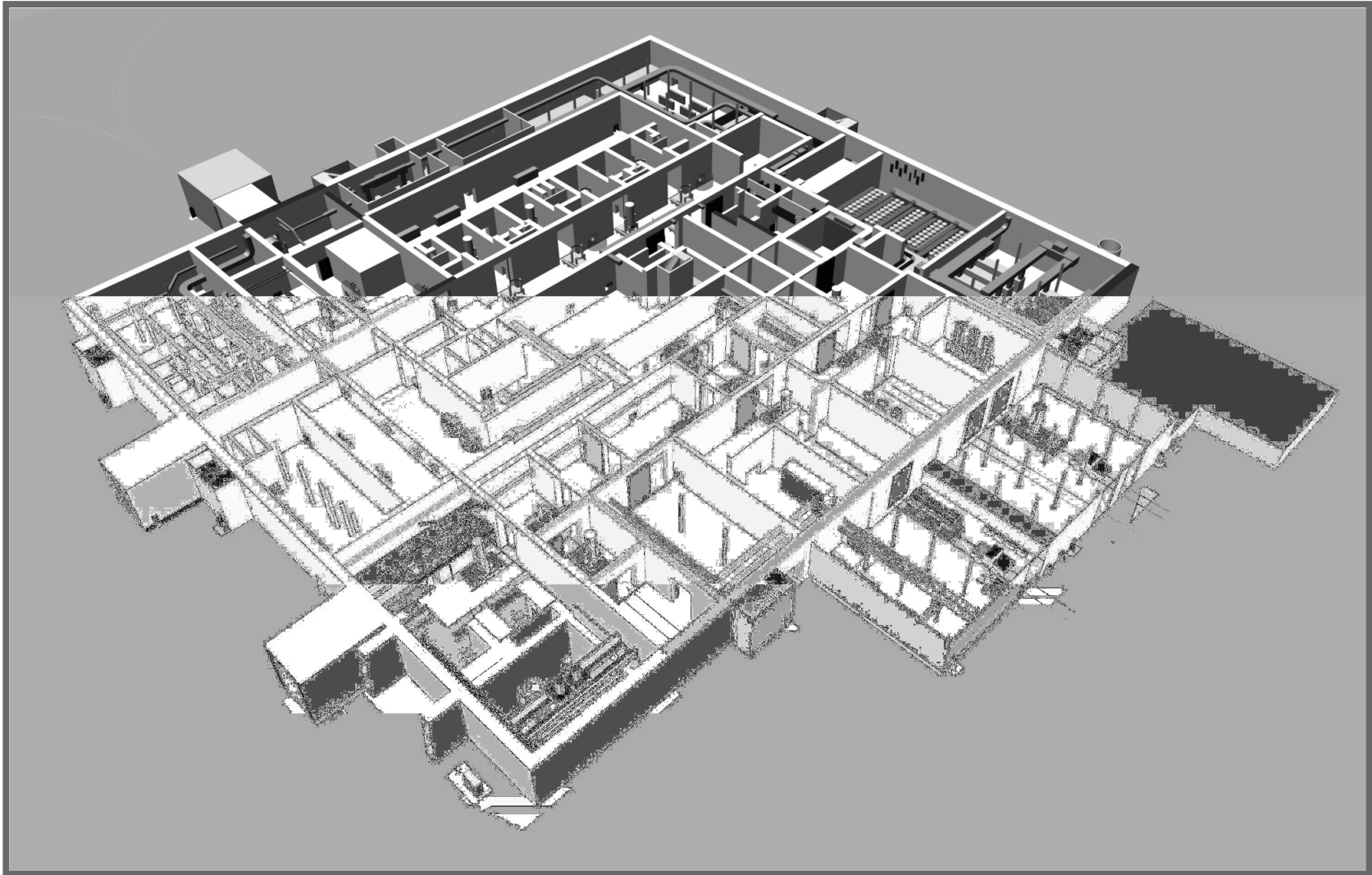
- ⑤ Receive Empty WP
- ⑥ Transfer WP to Pit
- ⑦ Transfer WP to WP Trolley
- ⑧ Transfer WP to WP Positioning Cell
- ⑨ Transfer Welded WP to Survey Station
- ⑩ Transfer to Tilt Station and Down End WP on to WP Pallet
- ⑪ Remove WP Trunnions (Both ends)
- ⑫ Transfer WP to WP Transporter
- ⑬ Transfer WP to Emplacement

SITE SPECIFIC CASK OPERATIONS

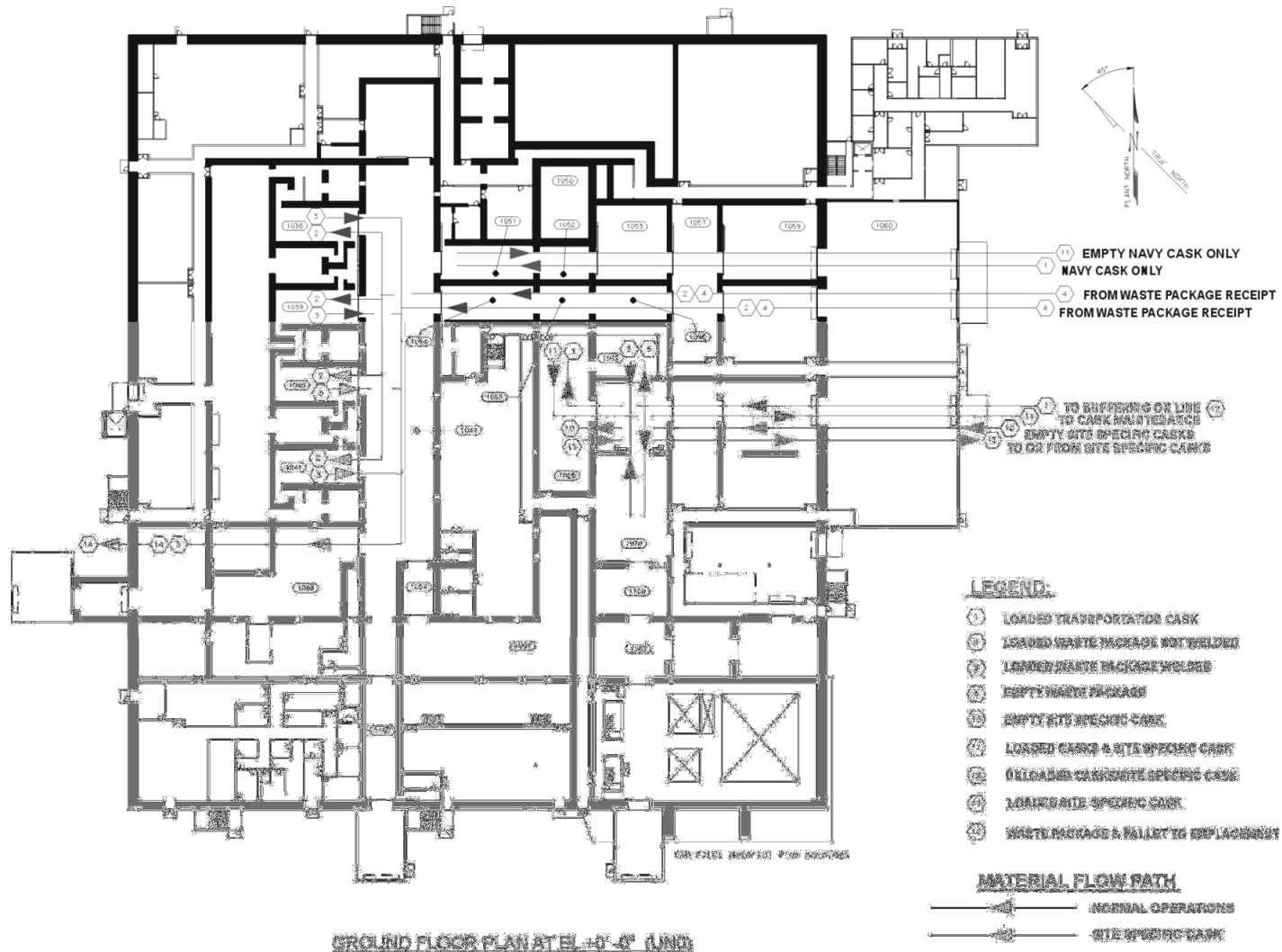
- ⑭ Receive Site Specific
- ⑮ Transfer Site Specific Cask To Fit
- ⑯ Transfer Loaded Site Specific Casks



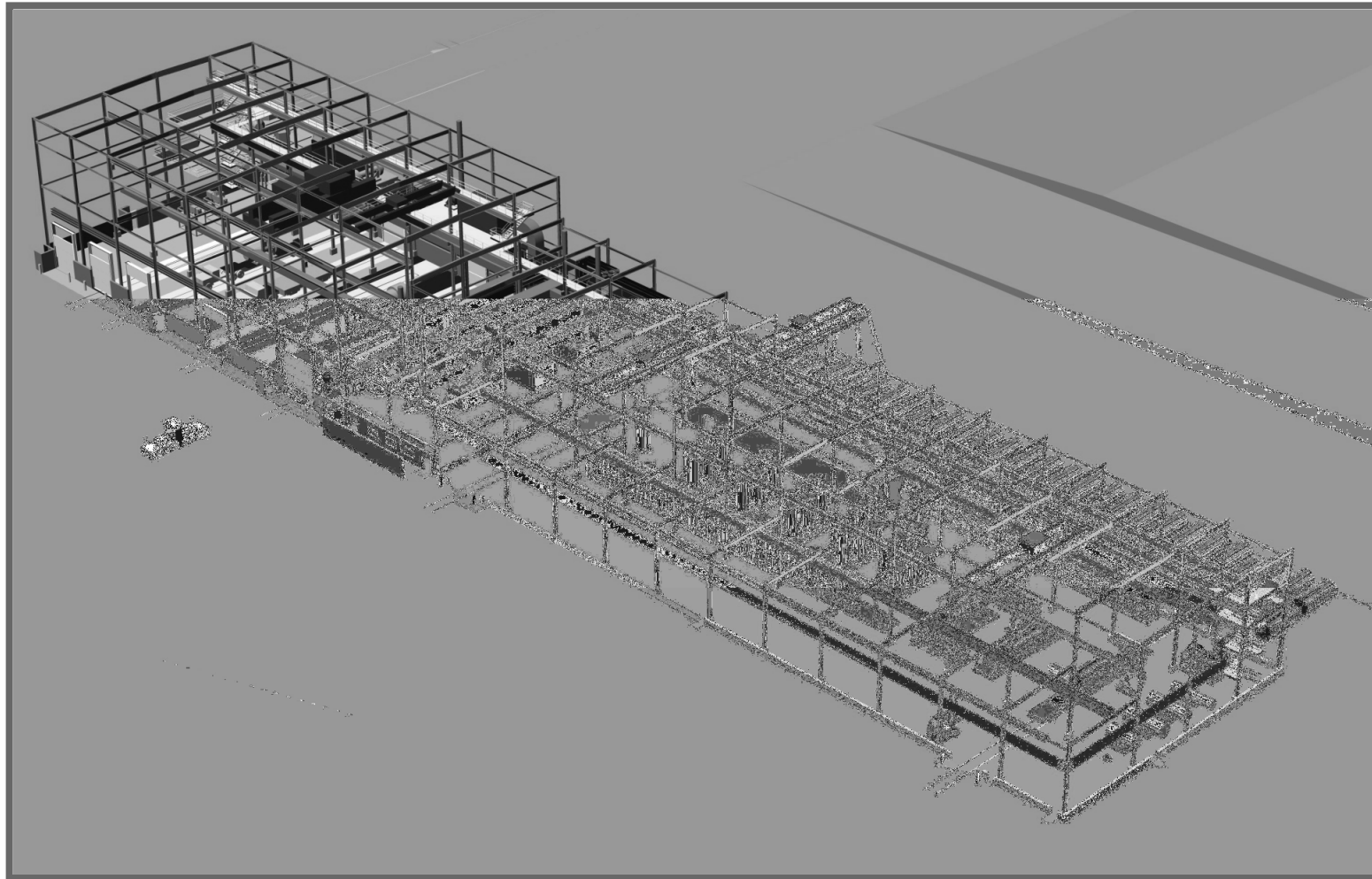
Dry Transfer Facility Description



Dry Transfer Facility Operations



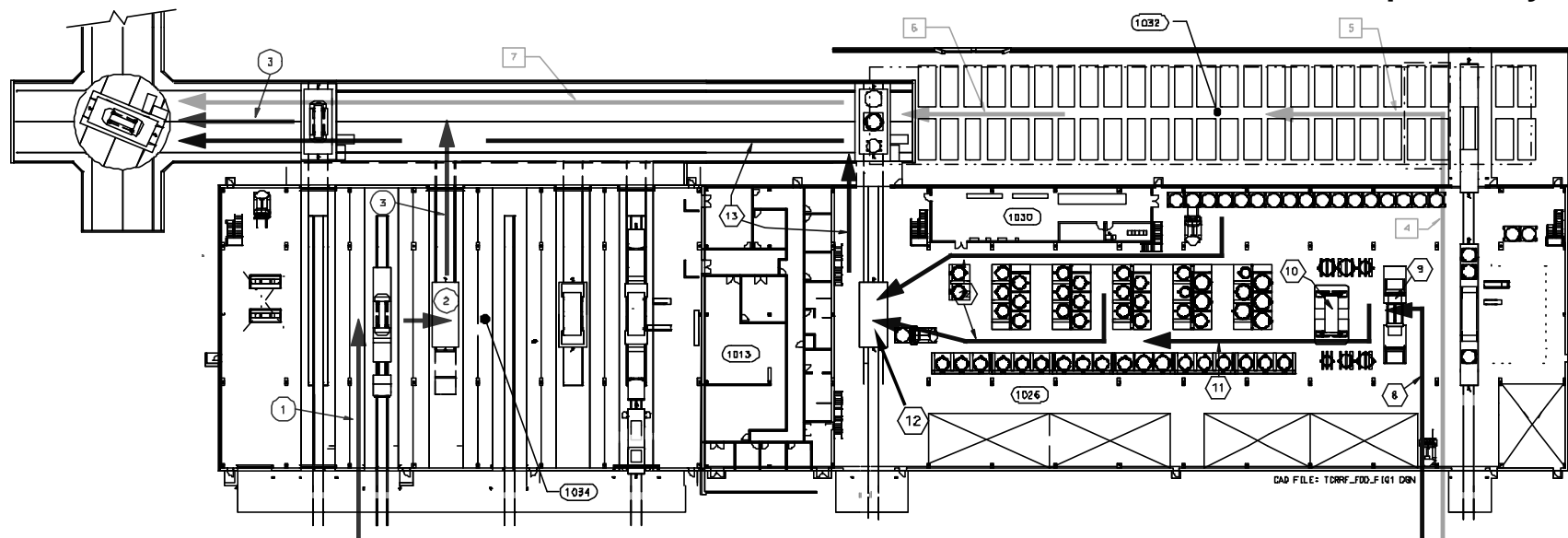
Cask and Waste Package Receipt Building Description



Cask and Waste Package Receipt Building Operations

Transportation Cask Receipt Return Facility

Warehouse Non-Nuclear Receipt Facility



TRANSPORTATION CASK OPERATIONS

- ① PERFORM TRANSPORTATION CASK RECEIPT INSPECTION AND SURVEY
- ② CASK/SKID TRANSFER TO SITE RAIL TRANSFER CAST (SRTC)
- ③ TRANSFER OF SRTC FROM RECEIPT BLDG. TO PROCESSING VIA BUFFER

SITE SPECIFIC CASK OPERATIONS

- ④ NEW MSC RECEIPT AND INSPECTION
- ⑤ TRANSFER MSC/SKID TO STAGING PAD
- ⑥ TRANSFER TO MSC/SKID TO SRTC
- ⑦ TRANSFER TO MSC TO PROCESS BLDG. VIA BUFFER

WASTE PACKAGE OPERATIONS

- ⑧ WASTE PACKAGE AND LID RECEIPT
- ⑨ WASTE PACKAGE AND LID TRANSFER TO STAND FOR INSPECTION
- ⑩ TRUNNION COLLAR INSTALLATION
- ⑪ VERTICALIZE AND STAGE WASTE PACKAGE AND LID
- ⑫ WASTE PACKAGE AND LID TRANSFER FROM INVENTORY TO SRTC
- ⑬ TRANSFER WASTE PACKAGE AND LID FROM RECEIPT BLDG TO PROCESS BLDG VIA BUFFER



Aging Transporter



Aging Pad

